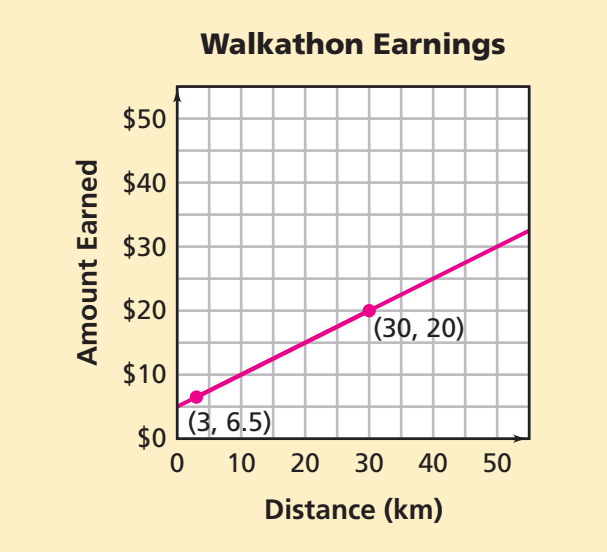
Investigation 3

Solving Equations

In the last investigation, you examined the patterns in the table and graph for the relationship between Alana's distance d and money earned A in the walkathon.

The equation $A = 5 + 0.5d$ is another way to represent the relationship between the distance and the money earned. The graph of this equation is a line that contains infinitely many points. The coordinates of the points on the line can be substituted into the equation to make a true statement.



For example, the point $(3, 6.5)$ lies on the line. This means that $x = 3$ and $y = 6.5$. So, $6.5 = 5 + 0.5(3)$ is a true statement.

Similarly, the point $(30, 20)$ lies on the line which means that $x = 30$ and $y = 20$, and $20 = 5 + 0.5(30)$ is a true statement.

We say that $(3, 6.5)$ and $(30, 20)$ are *solutions* to the equation $A = 5 + 0.5d$ because when the values for d and A are substituted into the equation we get a true statement. There are infinitely many solutions to $A = 5 + 0.5d$.

Because the corresponding entries in a table are the coordinates of points on the line representing the equation, we can also find a solution to an equation by using a table.

d	*A*
0	5
1	5.5
2	6
3	**6.5**
4	7
20	15
25	17.5
30	**20**

3.1 Solving Equations Using Tables and Graphs

In an equation with two variables, if the value of one variable is known, you can use a table or graph to find the value of the other variable. For example, suppose Alana raises $10 from a sponsor. Then you can ask: How many kilometers does Alana walk?

In the equation $A = 5 + 0.5d$, this means that $A = 10$. The equation is now $10 = 5 + 0.5d$.

Which value of d *will make this a true statement?*

Finding the value of d that will make this a true statement is called *solving the equation* for d.

Problem 3.1 Solving Equations Using Tables and Graphs

A. Use the equation $A = 5 + 0.5d$.

1. Suppose Alana walks 23 kilometers. Show how you can use a table and a graph to find the amount of money Alana gets from each sponsor.

2. Suppose Alana receives \$60 from a sponsor. Show how you can use a table and a graph to find the number of kilometers she walks.

B. For each equation:

- Tell what information Alana is looking for.
- Describe how you can find the information.

1. $A = 5 + 0.5(15)$

2. $50 = 5 + 0.5d$

C. The following equations are related to situations that you have explored. Find the solution (the value of the variable) for each equation. Then, describe another way you can find the solution.

1. $D = 25 + 2.5(7)$

2. $70 = 25 + 2.5t$

ACE **Homework starts on page 57.**

3.2 Exploring Equality

An equation states that two quantities are equal. In the equation $A = 5 + 0.5d$, A and $5 + 0.5d$ are the two quantities. Both represent the amount of money that Alana collects from each sponsor. Since each quantity represents numbers, you can use the properties of numbers to solve equations with one unknown variable.

Before we begin to solve linear equations, we need to look more closely at equality.

What does it mean for two quantities to be equal?

Let's look first at numerical statements.